

Exploring the Relationship between Sleep Quality and Cancer-related Fatigue on Breast Cancer Patients Undergoing Chemotherapy

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ABSTRACT

OBJECTIVE: The purpose of this study was to analyze the correlation of sleep quality and cancer-related fatigue (CRF) in breast cancer patients undergoing chemotherapy.

METHODOLOGY: This research design uses cross-sectional. The sampling method was a total sampling of all breast cancer patients undergoing chemotherapy from August to October 2024 in a hospital in Banda Aceh, Aceh province, with a total of 100 respondents. Sample criteria are more than 18 years old, not experiencing severe stress, and not experiencing psychiatric disorders. Data were collected using the Pittsburgh Sleep Quality Index questionnaire and Piper Fatigue Scale 12. Data were analyzed using univariate analysis, t-test, and Pearson correlation.

RESULTS: The mean age of respondents was 47.63 ± 8.35 years; all respondents were Muslim, had a partner 74.0%, had university-level education 39.0%, unemployed 53.3%, and 38.0% had the second chemotherapy cycle. The mean CRF in respondents with good sleep quality was 3.85 ± 1.20 , while in respondents with poor sleep quality, it was 4.83 ± 1.57 , and there was a significant difference at p-value 0.004. Sleep quality significantly related to CRF ($r = 0.635$, p-value < 0.001)

CONCLUSION: The sleep quality of breast cancer patients undergoing Chemotherapy is closely related to CRF. The better the sleep quality, the lower the fatigue level. It is recommended that healthcare providers should update the design of facilities and rooms for chemotherapy administration to improve sleep quality.

KEYWORDS: Breast cancer, cancer, chemotherapy, fatigue, sleep, sleep quality

INTRODUCTION

Cancer is the second leading cause of death globally¹. The incidence of new cancer in 2022 globally is estimated at 20 million cases, and around 9.7 million of them experience death. Breast cancer ranks second highest in the world and is estimated at 2.3 million new cases (11.6%) with a death rate of 670 thousand (6.9%) deaths². The same thing also happened in Indonesia; in 2020, one of the highest new cancer cases was breast cancer, which was 65,858 cases with a death rate of 22,430 cases³. The number of cases of cancer patients globally who need Chemotherapy each year is 9.8 million patients, and the majority of them are breast cancer⁴.

Breast cancer causes impairment in various functions of the patient's life⁵. Fatigue or Cancer-Related Fatigue (CRF) and sleep disturbances are common problems often reported by cancer patients during chemotherapy that have a significant impact on all aspects of patient's lives, including physical, psychosocial, professional, and socioeconomic^{6,7,8}. The prevalence of fatigue in breast cancer patients is 46.3% of cases and increases significantly with the number of chemotherapy cycles⁶. Cancer patients undergoing chemotherapy experience moderate

(50%) and severe (42.4%) levels of fatigue⁹. There are multifactorial causes associated with the incidence of fatigue in cancer patients, namely individual factors (both physical and psychological) and contextual factors^{9,10}.

Overall sleep quality (sleep latency, daytime dysfunction, sleep efficiency, sleep duration, and subjective sleep quality) was significantly worse in patients treated with all three methods (chemotherapy, radiotherapy, surgery) than in patients who did not receive all three methods⁷. Sleep is essential for metabolic regulation, cognitive function, quality of life, mood, and all other aspects of life. Poor sleep quality affects physiological, psychological and social functioning. In contrast, good sleep quality is necessary to reduce the likelihood of developing life-threatening chronic diseases affecting the cardiovascular, respiratory, metabolic and endocrine systems^{11,12}.

Based on previous studies, there is an association between sleep quality and fatigue in cancer patients, such that patients with better sleep quality have lower fatigue⁷. There is a significant relationship between fatigue and sleep quality ($r = 0.210$), where sleep quality is worse in breast cancer patients who experience increased fatigue⁵. In addition, in the multivariate analysis of Loh et al. 's study, only fatigue was significantly associated with sleep disturbances in cancer patients²⁵. In another study, it was also mentioned that there was a moderate correlation

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between sleep disturbance and fatigue²⁶.

In Aceh Province, the prevalence of breast cancer is high, as is the number of patients who receive chemotherapy. Based on data on the number of cases of breast cancer patients undergoing Chemotherapy at Zainoel Abidin Banda Aceh Regional General Hospital as a referral hospital in Aceh province, in 2022, there were 341 people. The high incidence of breast cancer compared to other types of cancer needs to be a concern, so it is essential to research breast cancer patients. However, no studies have explored the relationship between sleep quality and CRF, especially in breast cancer patients. This study's objective is to analyze sleep quality with cancer-related fatigue in breast cancer patients undergoing chemotherapy.

METHODOLOGY

Study Design

This study was a correlative quantitative study with a cross-sectional design.

Population and Sample

The population of this study were all breast cancer patients who underwent chemotherapy from August to October 2024 in one hospital in Banda Aceh, Aceh Province. Based on visit data to the chemotherapy unit, 100 people and sampling using total sampling. Sample criteria are more than 18 years old, not experiencing severe stress, and not experiencing psychiatric disorders.

Instrument

This study used a demographic data questionnaire to obtain characteristic data, the Pittsburgh Sleep Quality Index (PSQI) questionnaire to obtain sleep quality and the Piper Fatigue Scale 12 (PFS-12) questionnaire for fatigue. The PSQI is a popular instrument for assessing sleep quality in various populations. The Indonesian version of the PSQI has been tested for validity and reliability in Indonesia. Research conducted in 2015 in Jakarta regarding the Indonesian edition of the PSQI resulted in an internal consistency test of Cronbach's Alpha 0.79, content validity 0.89, construct validity showing good correlation of components with PSQI global score, significant known group validity ($p < 0.001$), sensitivity value is 1, specificity 0.81, and the cut-off point is 5²⁷. The Piper Fatigue scale-12 is a popular instrument for measuring fatigue in cancer patients. This questionnaire consists of 12 questions. The minimum score is zero, while the maximum score is 120. Furthermore, the score will be divided by 12 between 0 and 10. Validity and reliability tests have been conducted on this questionnaire in Indonesia. The final results show that all question items are valid; the r-value of all question items is >0.400 . Reliability test results using Cronbach's alpha with a computer program showed reliable results at Cronbach's alpha of 0.880²⁸.

The data collection procedure begins with an approach to prospective respondents. The researcher

explained the details of the study to prospective respondents and then asked about the willingness of prospective respondents to become respondents in this study. If willing, then the respondent is invited to sign an informed consent. The questionnaire was given to the respondent to be filled in by the respondent himself; the time required was about 20 minutes. After completing the questionnaire, the researcher checked its completeness and analyzed it.

Data Analysis

The data were analyzed using univariate analysis to describe the frequency and percentage. Data about the mean difference in fatigue in each sleep quality parameter using a t-test was used to identify the relationship between sleep quality and fatigue using Pearson correlation.

Ethical Statement

The entire research process was carried out after obtaining proof of ethical clearance from the research ethics committee by research on human subjects, with number 193/ETIK-RSUDZA/2024.

RESULTS

Characteristics of Respondent

The mean age of respondents was 47.63 ± 8.35 years; all respondents were Moslem, had a partner about 74.0%, had university-level education about 39.0%, unemployed about 55.0%, and the second chemotherapy cycle was 38.0%. The data is shown in Table I.

Table I: Characteristics of Respondent (n=100)

Characteristics	n (%)
Age, years (mean$\pm$SD)	
47.63 $\pm$ 8.35	
Religion	
Islam	100 (100.0)
Status of Couple	
Single	4 (4.0)
Married	74 (74.0)
Widow	22 (22.0)
Educational level	
Basic school	21 (21.0)
Junior school	13 (13.0)
Senior school	27 (27.0)
University education	39 (39.0)
Job	
Employer	55 (55.0)
Unemployed	45 (45.0)
Chemotherapy cycles	
2	38 (38.0)
3	18 (18.0)
4	23 (23.0)
5	14 (14.0)
6	7 (7.0)
Total	100 (100.0)

The mean fatigue based on sleep quality parameters is shown in **Table II** below. The mean CRF in respondents with good sleep quality was 3.85 ± 1.20 , while in respondents with poor sleep quality, it was 4.83 ± 1.57 . There was a significant difference with a p-value of 0.004.

There is a significant positive relationship between sleep quality and cancer-related fatigue. This information can be seen in **Table III**.

Table II: Frequency of components of Pittsburgh Sleep Quality Index (PSQI) and mean of CRF

Sleep quality parameters	%	Mean $\pm$ SD	p-value
Subjective sleep quality			0.000
Very good	0		
Fairly good	24	4.08 ± 1.13	
Fairly bad	67	4.69 ± 1.12	
Very bad	9	6.19 ± 0.61	
Sleep efficiency			0.000
>85%	78	4.44 ± 1.15	
75-84%	19	5.38 ± 0.98	
65-74%	0		
<65%	3	6.53 ± 0.55	
Daytime dysfunction			0.000
never	2	4.00 ± 0.28	
<1 times per week	28	4.20 ± 1.08	
1-2 times per week	55	4.65 ± 1.20	
≥ 3 times per week	15	5.75 ± 0.83	
Sleep disturbance			0.032
0	2	4.30 ± 1.13	
1-9	92	4.60 ± 1.18	
10-18	6	5.91 ± 0.99	
Sleep duration (hours)			0.000
>7	22	4.23 ± 1.35	
6-7	34	4.24 ± 0.94	
5-6	33	4.89 ± 0.94	
<5	11	6.30 ± 0.84	
Sleep latency (minutes)			0.007
<15	3	3.76 ± 1.50	
16-30	48	4.36 ± 1.17	
31-60	48	5.01 ± 1.12	
>60	1	6.80 ± 0.00	
Overall sleep quality score			0.004
Good	15 (15.0%)	3.85 ± 1.20	
Poor	85 (85.0%)	4.83 ± 1.57	

Table III: The relationship between quality of sleep and cancer-related fatigue (n=100)

Variable	n	Mean (SD)	Pearson correlation (r)	P value
Quality of sleep	100	7.80 ± 2.22	0.635	<0.001
CRF	100	4.68 ± 1.21	1	

DISCUSSION

The results showed a significant relationship between sleep quality and cancer-related fatigue (p-value <0.001). This is in line with research conducted by Imanian M 2019¹³ on sleep quality and fatigue in breast cancer patients undergoing Chemotherapy. The results of the Spearman correlation test in the study showed a significant relationship between fatigue and sleep quality (0.210). The results of previous studies also identified the description of sleep quality, anxiety, and fatigue in cancer patients. They found that chemotherapy treatment in cancer patients contributed to poor sleep quality, anxiety and fatigue²⁴. Improving sleep quality in Chemotherapy patients can reduce fatigue risk and accelerate treatment. The results showed that the occurrence and severity of sleep problems were significantly associated with fatigue. CRF is also a strong predictor of sleep quality¹⁹. In his research, Schreier also found a positive correlation between sleep problems and fatigue²⁰.

In terms of sleep quality, most respondents reported poor sleep quality (85%). Amalia, in her research, stated that sleeplessness, excessive urination at night, pain, coughing, loud snoring, waking up in the middle of the night or early in the morning, and other complaints such as nightmares or anxiety are sleep problems that are often faced by cancer patients who are undergoing chemotherapy¹⁵. In addition, sleep disorders can also be caused by factors that influence it¹⁶. Factors that can cause sleep disturbances include Chemotherapy, type of treatment, pain, stage, environment, age, anxiety, marital status and employment²⁹. Krisdhiyanti 2016¹⁴ research on sleep quality in breast cancer patients who are undergoing Chemotherapy found that 83.13% experienced poor sleep quality, as well as those that affect sleep quality, including 60 minutes needed to be able to sleep, the presence of sleep problems and dysfunction during the day.

In Mommayyezi M 2021¹⁸ research on 149 cancer patients undergoing Chemotherapy, 69.3% had poor sleep quality. While the average sleep duration was 5.57 ± 0.54 hours, and the average duration to fall asleep was 69.44 ± 46.58 minutes. In addition, along with improving sleep quality, it was found that the average fatigue also increased (p < 0.001, r = 0.63). Breast cancer patients experience insomnia and range from 20-70%²¹.

During treatment, even months to years, patients undergoing Chemotherapy will experience CRF from

moderate to severe range²². Fatigue in cancer patients is different from fatigue in non-cancer patients. CRF has many symptoms, including physical, emotional, mental, and spiritual weakness, fatigue, and lack of energy. In this type of fatigue, the sufferer feels tired without doing any particular activity. There is an argument for this type of fatigue that it does not improve after sleep and rest²³.

Implications for nursing

Nursing service providers can make an adjustment to conduct a comprehensive assessment, including sleep quality and fatigue. Nurses also design and implement nursing care plans to improve sleep quality and reduce fatigue. Nursing interventions include biological, psychological, spiritual, social and cultural components. Educational institutions include sleep quality and fatigue in patients undergoing Chemotherapy in the curriculum and learning. Comprehensive research related to sleep quality and fatigue is a concern for nursing researchers.

CONCLUSION

There is a significant relationship between sleep quality and CRF. The better the sleep quality, the lower the fatigue level. It is recommended that healthcare providers should update the design of facilities and rooms for chemotherapy administration to improve sleep quality.

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AUTHOR CONTRIBUTION

Syarif H: Conceived the presented idea and corresponding author, collected data, and supervised the findings of this work.

Amni R: Collecting data, training the enumerators, and verifying analytical methods.

Jufrizal, J: Developed the theory and performed the computations.

All authors discussed the results and contributed to the report and final manuscript.

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